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ABSTRACT

This paper reports on a multijurisdictional study of the influence of school district long-term guaranteed debt liabilities on housing values. The empirical setting for the study was the Columbus, Ohio, metropolitan area. The objective of the research was to empirically test the debt-illusion hypothesis by examining the extent to which long-term guaranteed debt liabilities of school districts are capitalized into housing values. The research employed the hedonic regression approach to estimate the determinants of constant-quality house prices, including indicators of school-district debt liabilities. In doing so, it analyzed the price effects of school-district liabilities while controlling for variations in structural housing characteristics, school-district property tax levels, and school-district quality. The results of the study support the debt-illusion hypothesis and suggest that the potential exists for local public officials to utilize debt instead of current taxes as a means of boosting spending levels above that which might otherwise be affirmed by taxpayers. The estimation results indicated that both school-district property taxes and debt liabilities are severely undercapitalized into housing values. Specifically, the results show that variations in taxes and debt liabilities have only a slight impact on housing values. (Author/WFA)

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DEBT ILLUSION AMONG LOCAL TAXPAYERS: AN EMPIRICAL INVESTIGATION

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THIS PAPER ENCOMPASSES A MULTI-JURISDICTIONAL study of the influence of school district long-term guaranteed debt liabilities on housing values. The empirical setting for the study is the Columbus, Ohio, metropolitan area. The objective of this research is to empirically test the *debt illusion* hypothesis by examining the extent to which long-term guaranteed debt liabilities of school districts are capitalized into housing values. Given that capitalization of local government fiscal variables into house values has been revealed in prior research, we expect that the existence of debt illusion at the local government level will be exposed in housing values. Capitalization of debt liabilities into house values, or the lack thereof, will suggest whether taxpayers underestimate systematically the value of future tax liabilities necessary to pay the current indebtedness of a government jurisdiction.

We employ the hedonic regression approach to estimate the determinants of constant-quality house prices, including indicators of school district debt liabilities. In doing so, we analyze the price effects of school district debt liabilities, while controlling for variation in structural housing characteristics, school district property tax levels, and school district quality. The hedonic house price estimates will allow us to examine citizen preferences for varying tax, public service, and debt levels. What's more, the hedonic house price estimates will indicate whether community residents, as suggested by the preferences of home purchasers, (1) recognize fully the debt liabilities of local governments and (2) compare local government debt liabilities and current tax liabilities.

LOCAL GOVERNMENT DEBT AND THE DEBT ILLUSION HYPOTHESIS

Long-term indebtedness and issuance of debt instruments are mainstays of local government budgeting and finance in the United States. One of the principal types of long-term debt is "full faith and credit" or guaranteed debt. Typically, to finance construction and other capital needs, school districts issue general obligation bonds that are usually backed or paid with property tax levies dedicated to that purpose.[1] This is the case in Ohio.

Outstanding long-term debt of local governments (counties, townships, municipalities, school districts, special districts) has increased steadily in recent years, reaching approximately $699.1 billion at the end of fiscal year 1995-96.[2] According to local government census data, approximately $281.08 billion was guaranteed debt, a nominal increase of 29.7 percent from the fiscal 1992-93 guaranteed debt liability of $216.65 billion. The real increase in local government guaranteed debt liability for that period was approximately 21.6 percent.[3] The ratio of guaranteed debt liability to current tax revenues grew from 0.579 in FY 1992-93 to 0.64 in FY 1995-96, suggesting that local governments are becoming more reliant on debt to pay for tax-financed public services, deferring a larger portion of their cost to future years.

The *debt illusion* hypothesis holds that residents of a community may underestimate the true cost of current public service levels if some of that cost is deferred to future years through the issuance of loans, bond issues, and other debt instruments. The debt illusion hypothesis is a specific manifestation of a much broader hypothesis of local public finance economics referred to as *fiscal illusion*. The fiscal illusion hypothesis posits that elements of a local community's tax structure tend to be obfuscated from, or not completely apparent to, community residents. Residents misperceive the total cost of providing local public services and, as a result, local public expenditures are biased upward or downward depending on whether residents underestimate or overestimate the true monetary cost of public services.

The principle of *Ricardian Equivalence* suggests that rational and informed taxpayers would equate the value of the current tax liability with the present discounted value of the future tax liabilities necessary to finance an equal amount of debt. Debt illusion is expected to arise through community residents' lack of knowledge or misperception about

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the operation and effect–in particular, the tax cost in future years–of guaranteed debt issued in the current year. Due to their imperfect knowledge, taxpayers pay little or no attention to the tax liabilities that will be imposed on them in future years to pay the principal and interest on debt, the proceeds of which are spent in the current year (Vickrey, 1961). Oates (1988) suggests that "taxpayers are more likely to perceive the costs of public programs if they pay for them through current taxation, than if tax liabilities are deferred through public sector borrowing."

To examine whether debt illusion is present at the local government level, we utilize Tiebout's (1956) consumer choice perspective of local government finance. Tiebout suggests that utility maximizing citizens weigh both the public benefits and costs of residing in different local jurisdictions and select a residential site based on the surplus of public benefits over public costs. According to Oates (1969), variation among local government jurisdictions in the surplus of public benefits over public costs presumably will be capitalized into the value of properties within these jurisdictions. Consequently, the capitalization effect can be utilized as a measure of the degree to which citizens recognize and value the benefits of local public services and their corresponding tax costs, including the future tax costs of current debt liabilities.

Epple and Schipper (1981) investigated the presence of debt illusion among local taxpayers in the Pittsburgh, Pennsylvania, area by estimating the influence of municipal pension liabilities on local housing values. They estimated cross-sectional capitalization models that used the municipal median house value and the unfunded prior service cost (a proxy for municipal pension burden), and controlling for school expenditures, the effective tax rate, socioeconomic conditions, and distance from the Pittsburgh central business district. The estimation results were inconclusive. When Pittsburgh is excluded, the parameter estimates indicated that municipal pension obligations are overcapitalized (the coefficient on the pension liability variable exceeded unity). When Pittsburgh is included, the capitalization effect all but vanished. Epple and Schipper offered several reasons for the ambiguous results, including inappropriate measure of pension liability, small sample size, omission of pertinent public sector and economic variables, and the variability in the timing of the variables employed.

Dollery and Worthington (1995) utilized pooled time series, cross-sectional data for 27 municipalities in the Sydney, Australia, area to estimate the capitalization effects of municipal debt liabilities. They control for the influences on housing values of median income, per capita municipal expenditures, local housing activity, and distance from the Sydney central business district. Dollery and Worthington fail to control for the effect of local tax rates or local tax levels on housing values, however, which is a significant weakness of their capitalization model. The estimated capitalization effect for municipal debt is negative and statistically significant, but the parameter estimates indicate that debt is undercapitalized (the coefficient for the debt liability variable is less than one). Dollery and Worthington conclude that their capitalization estimates provide only necessary, not sufficient, evidence that debt is preferred to current taxation, and that this phenomenon may lead to an upward bias in local public expenditures.

The determination of whether debt illusion exists among taxpayers has significant implications for local government spending and debt policy, for state government limitations on local government debt issuance, and for local housing markets. Debt illusion may lead to a propensity for local government budgets to be biased upward. If taxpayers underestimate the true cost of public debt, local public officials may authorize service levels (to be paid from debt proceeds plus current tax revenues) higher than would be endorsed by taxpayers who recognize fully the future tax liabilities necessary to pay off that debt. Consequently, local governments that rely more heavily on debt financing may exhibit higher expenditure levels than local governments that finance service costs more heavily out of current taxation, ceteris paribus. Moreover, the presence of debt illusion may provide the motivation and opportunity for local government officials to utilize debt financing when taxpayers are not willing to endorse financing via current taxation or when financing from current taxation would be more appropriate.

Given the public spending propensities that may arise if debt illusion is present, state limitations (either constitutional or statutory) on the use and issuance of debt by local governments become all the more important and appropriate. Most notably, *referendum requirements* prohibit local governments from issuing guaranteed debt without voter approval, and *debt level limitations* prohibit

local governments from carrying debt in excess of specified levels, typically a percentage of the jurisdiction's property valuation. States also often enact local *debt usage limitations* specifying the purposes for which issues may be utilized.[4]

Finally, debt illusion may have an impact on the efficiency of local housing markets, leading to the overvaluation of housing in communities where the local government relies more heavily on debt than on current taxes to finance current service costs.

EMPIRICAL METHODOLOGY

The empirical model we employ relates the natural log of the nominal unit sales price of a single-family home V to a set of structural, neighborhood, and public sector attributes possessed by that house X, a set of binary variables Y representing the year in which the house was transacted, a school district student performance indicator P^{IV}, the school district effective property tax rate t, and measures of school district debt liability d for the school district in which the house is located. The estimating equation may be expressed as follows:

$$(1) \quad lnV_{it} = \alpha + \sum_{j=1}^{n} \beta_j X_{ij} + \chi_t Y_t + \delta_i P_i^{IV} + \phi_i d_i + \varphi_i t_i + \varepsilon_i$$

where i is a transacted house, t is the year in which the house was transacted, j represents the n structural, neighborhood, and public sector characteristics possessed by the house other than school district characteristics, and ε_i is a random error term.[5] The unit sales price V is the price per square foot of living space in the transacted house. The binary variables Y_t represent the year in which a particular house was transacted. Thus, the regression coefficients χ_t represent the year-specific shifts in the regression intercept–the time-determined shifts in house prices.

The focal variables in this analysis are t, the school district effective property tax rate, and d, the school district debt liability. The effective property tax rate is a percentage computed by dividing total taxes collected on taxable real, tangible personal, and utility property by the total value of such taxable property. Debt liability is a percentage computed by dividing the outstanding long-term guaranteed indebtedness by the total value of taxable real, tangible personal, and utility property. We test two hypotheses relating to the focal variables.

Hypothesis 1: If $\phi = -1$, then school district debt liabilities to be paid in the future by school district taxpayers are being capitalized fully into the value of houses. This would suggest that debt illusion is not present, that the deferred tax obligation of the debt liability is recognized fully by taxpayers. If, however, $\phi < -1$, then school district debt liabilities are being under-capitalized into housing values. Under-capitalization would suggest that debt illusion is present. Taxpayers either are not fully aware of the cost of paying off local government debt or may prefer debt to current taxation because they perceive that debt-financed service costs are somehow less burdensome.

Hypothesis 2: If $\phi = \varphi$, then school district debt liabilities and property taxes are being capitalized equivalently into house prices. Regardless of whether full or imperfect capitalization of debt liabilities is occurring, this may suggest that taxpayers treat the cost of local government debt and current taxes equivalently. Consequently, local public officials would have no incentive to substitute debt financing for current taxes based on taxpayer preference for the former.

The school district performance measure P involves student pass rates on Ohio's Ninth Grade Proficiency Test, which measures knowledge in reading, writing, math, and citizenship.[6] The data for school district performance represent the percentage of students taking the Proficiency Test for the first time who pass all four components during the 1991-to-1994 period. The performance indicator P_{IV} is an instrumental variable estimated utilizing the following production function specification:

$$(2) \quad P_i = \gamma + \sum_{k=1}^{m} \eta_k F_{ik} + \psi_i$$

where P_i represents the pass rate as described above for the school district containing transacted house i, F_i represents the educational service levels or inputs for the school district containing the transacted house i, k represents the m educational inputs related to the performance indicator, and ψ_i is a random error term.

The instrumental variable is estimated to resolve problems arising due to the likely correlation between school district educational service levels or input variables and the performance indicator, if

all are entered in the hedonic regression model. While the parameter estimates in the presence of multi-collinearity would remain consistent and unbiased, the variances of the parameter estimates of the collinear variables would be inflated, influencing the statistical significance of these estimators. Exclusion of the educational service level variables from the hedonic regression model in response would lead to biased parameter estimates due to the omission of relevant independent variables. Moreover, correlation between the school district performance indicator and the random error term would arise from such an omission. The parameter estimates of the remaining independent variables would no longer be consistent and unbiased. Employing the instrumental variable approach will account for the effect of variations in educational service levels on constant-quality house prices, but avoid the estimation problems outlined above.

The Columbus sample is 23,715 single-family homes sold during 1992-1995, as follows: 7,170 (30.2 percent) in 1992, 7,197 (30.3 percent) in 1993, 5,622 (23.7 percent) in 1994, and 3,726 (15.7%) in 1995. The Data Appendix contains descriptions of the variables utilized to estimate Equations 1 and 2 and their source.[7] Table 1 contains descriptive statistics for the dependent and independent variables employed in each estimation model.

The present research improves on the existing debt illusion studies on several counts. We change the unit of analysis from the (aggregate) municipal level to the (disaggregated) single-family home level. Consequently, the conclusions about the effects of local government debt liabilities on the valuation of single-family homes and any conjecture about taxpayer recognition of local government debt liabilities will not rely on the presence of aggregate shifts in property values. By employing disaggregated data, we also permit the regression estimates to account more precisely for price variations due to variations in structural, neighborhood, and public sector characteristics of individual houses. More precisely, the estimates of the impact of variation in structural and neighborhood attributes will not rely

Table 1
Variable Descriptive Statistics

Education Production Function Variables	*Mean*	*Standard Deviation*
School District Performance[1]	40.03	20.94
Average Teacher Salary	6,914.42	2,549.26
Teacher Training Level	46.31	12.56
Pupil-Teacher Ratio	16.86	2.00
Expenditure Per Pupil	5,453.42	803.44
Low Income Enrollment	18.79	16.91
College Prep Enrollment	45.92	30.55
Unit House Price[1]	58.98	18.04
Lot Size	8,460.92	3,629.17
House Size	1,417.77	417.04
Age of House	2.25	19.30
Bedrooms	3.10	0.59
Bathrooms	1.57	0.59
Central Air Conditioning[2]	0.67	0.47
Full Basement[2]	0.51	0.50
Partial Basement[2]	0.35	0.48
1993 House Sale[2]	0.30	0.46
1994 House Sale[2]	0.24	0.43
1995 House Sale[2]	0.16	0.36
Neighborhood Educational Attainment	16.99	12.83
Neighborhood Income	35,811.30	11,882.97
Neighborhood Housing Vacancy	4.91	2.74
School District Performance IV	40.03	20.31
School District Tax Rate	3.71	0.39
School District Debt Liability	2.84	1.92
School District Debt Liability Lagged	2.73	2.03

[1]Dependent Variable
[2]Measured as binary variable. The mean indicates the percentage of houses in the sample with that attribute.
Source: See appendix for variable definitions and data sources.

simply on interjurisdictional average or median differences but will reflect variation in these attributes between houses and neighborhoods within jurisdictions. Finally, we improve on earlier designs by employing a much richer sample and set of explanatory variables, including a direct measure of public debt liability (improving on Epple and Schipper, 1981) and a property tax variable (improving on Dollery and Worthington, 1995).

REGRESSION ESTIMATES

The estimated educational production function, summarized in Table 2, renders intuitive results. The dependent variable is the percentage pass rate for students taking Ohio's Ninth Grade Proficiency Test for the first time. This rate indicates the percentage of first-time test takers who pass all components of the Proficiency Test. The regression model explains over 94 percent of the variation in the school district-level pass rate on the Proficiency Test. As would be expected, the parameter estimates suggest that the district-level pass rate is increasing in district average teacher salary, expenditure per pupil, and college prep enrollment; and that the district-level pass rate is declining in district pupil-teacher ratio and low-income enrollment. In contrast to what would be expected, however, the district-level pass rate is found to be declining in the district measure of teacher training–the percentage of teachers with at least a master's degree. We employ the predicted values of the dependent variable as an instrumental variable indicating school district academic performance in the hedonic house price functions.

The estimated hedonic house price functions, summarized in Table 3 also render intuitive results.

Table 2
Estimation Results: Educational Production Function

Variable	*Coefficient*	*p-value*
Constant	15.198	0.000
Average Teacher Salary	1.89E-03	0.000
Teacher Training Level	–0.184	0.000
Pupil-Teacher Ratio	–1.911	0.000
Expenditure per Pupil	2.13E-03	0.000
Low Income Enrollment	–1.133	0.000
College Prep Enrollment	0.113	0.000
Adjusted R^2	0.941	0.000

Table 3
Estimation Results: Hedonic Price Function

	Model 1		*Model 2*	
Variable	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Constant	4.935	0.000	4.942	0.000
Lot Size	2.35E-05	0.000	2.34E-05	0.000
Lot Size Squared	–5.15E-10	0.000	–5.13E-10	0.000
House Size	–9.85E-04	0.000	–9.89E-04	0.000
House Size Squared	2.04E-07	0.000	2.05E-07	0.000
Age of House	–3.89E-03	0.000	–4.02E-03	0.000
Age of House Squared	3.52E-05	0.000	3.63E-05	0.000
Bedrooms	1.76E-03	0.000	1.90E-03	0.000
Bathrooms	4.74E-02	0.000	4.74E-02	0.000
Central Air Conditioning	0.105	0.000	0.105	0.000
Full Basement	0.120	0.000	0.120	0.000
Partial Basement	9.65E-02	0.000	9.68E-02	0.000
1993 House Sale	4.20E-02	0.000	3.94E-02	0.000
1994 House Sale	4.47E-02	0.000	4.76E-02	0.000
1995 House Sale	6.29E-02	0.000	6.39E-02	0.000
Neighborhood Educational Attainment	–1.36E-02	0.000	–1.36E-02	0.000
Neighborhood Income	1.43E-06	0.000	1.46E-06	0.000
Neighborhood Housing Vacancy	–1.67E-02	0.000	–1.65E-02	0.000
School District Performance IV	3.13E-03	0.000	3.17E-03	0.000
School District Tax Rate	–3.87E-02	0.000	–3.92E-02	0.000
School District Debt Liability	–1.56E-02	0.000	–9.69E-02	0.000
School District Debt Liability Lagged		0.000	–7.07E-03	0.000
Adjusted R^2	0.438	0.000	0.439	0.000

The dependent variable is the actual unit sales price of a single-family dwelling. We compute the unit price for each house in the sample by dividing the actual sales price by the square footage of living space. Both regression models explain over 43 percent of the variation in the actual unit sales price of a single-family dwelling.

The parameter estimates for all of the structural control variables have the expected signs and, with the exception of bedrooms, are statistically significant. Most notably, the unit sales price of housing is increasing in lot size and bathrooms, and declining in age. The unit sales price also is declining in house size, suggesting (appropriately) that there is a decreasing marginal benefit to housing consumers from additional living space. In addition, the squared terms for lot size, house size, and age of house suggest that the relationship between these structural characteristics and the unit house price is nonlinear. The parameter estimate for central air conditioning suggests that houses with this characteristic on average cost more than houses without central air conditioning. The parameter estimates on full basement and partial basement suggest that houses with full basements on average cost more than those with either partial basements or no basements. Moreover, houses with partial basements cost more than those without basements. Finally, the parameter estimates on the sale year variables suggest that housing values increased slightly on an annual basis from 1992 to 1995.

The parameter estimates for the neighborhood and school district attributes are also intuitive in terms of their signs and are statistically significant. Appropriately, the unit house price is increasing in neighborhood income and declining in neighborhood housing vacancy and in the percentage of neighborhood residents failing to complete high school. The parameter estimates on the school district attributes also have the expected signs and are statistically significant. Interestingly, the parameter estimates indicate that unit house prices are increasing in school district academic performance. The price effect appears to be very slight, however. Both regression models suggest that a 1 percent increase in the Proficiency Test pass rate will lead to roughly a 0.003 percent increase in the unit house price.

As to the focal variables, the parameter estimates in both regression models for the tax rate, debt liability, and lagged debt liability variables are statistically significant. What's more, the estimated parameter values are all well below the full capitalization rate equal to -1, indicating that current property taxes and existing debt liabilities (future tax liabilities) are severely undercapitalized. For each estimated parameter value, t-tests indicate that the difference is statistically significant with a p-value less than .001. Therefore, Hypothesis 1 is rejected, supporting the debt illusion hypothesis. In addition, the parameter estimates in Model 1 suggest that while both taxes and debt liabilities are undercapitalized, taxes are capitalized at more than twice the rate of debt liabilities. A t-test employed utilizing a restricted model indicates that the difference in the estimated tax and debt liability parameter values is statistically significant. Thus, Hypothesis 2 is rejected. Combined with the lower capitalization rate for debt liabilities, rejection of Hypothesis 2 implies as well that debt illusion may be present.[8]

Specifically, the parameter estimates in both regression models indicate that a 1 percent increase in the school district effective property tax rate leads to about a 0.039 percent decrease in the unit house price. Based on the sample mean unit house price equal to $58.98 per square foot of living space, the price of a 1,500 square foot home would on average decline by roughly $34.50 for each 1 percent increase in the effective property tax rate. As to the school district debt liability (debt level as a percentage of taxable property values), the parameter estimate in Model 1 indicates that a 1 percent increase in the school district debt liability leads to about a 0.016 percent decrease in the unit house price. Based on the sample mean unit house price, the price of a 1,500 square foot home would on average decline by about $14.15 for each 1 percent increase in the debt liability.

CONCLUSIONS

The results support the debt illusion hypothesis and suggest that the potential exists for local public officials to utilize debt instead of current taxes as a means boosting spending levels above that which might otherwise be affirmed by taxpayers. The estimation results indicate that both school district property taxes and debt liabilities are severely undercapitalized into housing values. Specifically, we find that variations in taxes and debt liabilities have only a slight impact on housing values. We also find that the capitalization effect of property taxes is over twice as large as the capitalization effect of debt liabilities. These findings

suggest that school district residents may prefer debt to current taxes as a means of paying for educational services. Our findings also suggest that school district residents fail to fully realize not only the debt liabilities of their school districts, but district residents fail to fully realize the current tax levels of their school districts.

Notes

[1] Non-guaranteed debt is one of the other primary sources of debt financing employed by local governments in the United States Since the Ohio Constitution requires that children receive a "free" public education, user fees are generally unavailable to school districts as a financing tool. Consequently, school district debt is guaranteed. This is the case in most, if not all, states.

[2] Debt data obtained from the State and Local Government Finance Estimates published by the US. Department of Commerce, Bureau of the Census.

[3] The inflation adjustments are conducted using the Gross Domestic Product Implicit Price Deflator.

[4] Ohio law regulating the activities of school districts imposes each of these limitations School districts may not issue general obligation bonds without voter approval, and debt usage is specified in the state's Uniform Bond Law. In addition, school districts are prohibited from carrying an amount of debt that exceeds 7 percent of the district's taxable property valuation.

[5] Conceptually, the semi-log functional form is reasonable because it suggests that house prices do not vary linearly with housing attributes The semi-log form allows the value or implicit price of a characteristic to vary with the other characteristics in the equation (Sonstelie and Portney, 1980; Thibodeau, 1989). As well, the semi-log form simplifies the interpretation of the estimate implicit prices–indicating the percentage change in the aggregate price due to unit change in a particular characteristic.

[6] Passage of all four component-area tests is a requirement for graduation from high school in Ohio Students are permitted up to eight attempts to pass each component area test during their eighth through twelfth grade years.

[7] Housing sales and structural data were obtained via the Metroscan Real Estate Database System published on CD-ROM by Transamerica, Inc The Metroscan database for the Columbus metropolitan area contains tax assessment and ownership-related information on all real estate parcels. The standard profile for a real estate parcel includes structural housing attributes, taxing districts within which parcels are situated, and recent sale information.

[8] Pindyck and Rubinfeld (1991, 114) suggest that the restricted regression model specified below be estimated to provide a statistical test of the difference between the parameter estimates for tax rate (X_{iT}) and debt liability (X_{iD}).

$$Y_i = \alpha + \ldots + \beta_{T*D}(X_{iT} + X_{iD}) + \gamma X_{iD}$$

If $\gamma = 0$ then the difference between the tax rate and debt liability parameter estimates is not statistically significant. For the restricted regression model we obtain $\gamma = 0.023$. The parameter estimate is statistically significant with a p-value less than .001.

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Appendix

Variable Definitions and Data Sources

Education Production Function Variables		
Variable Name	Definition	Source
Average Teacher Salary	School district average teacher salary in year prior to house sale year.	Ohio Dept. of Education
Teacher Training Level	School district percent of teachers with master's degree in year prior to house sale year.	Ohio Dept. of Education
Pupil-Teacher Ratio	School district pupil-teacher ratio in year prior to house sale year.	Ohio Dept. of Education
Expenditure Per Pupil	School district expenditure per pupil in year prior to house sale year.	Ohio Dept. of Education
Low Income Enrollment	School district percent enrollment from ADC families in year prior to house sale year.	Ohio Dept. of Education
College Prep Enrollment	School district percent of graduates in college preparatory curriculum in year prior to house sale year.	Ohio Dept. of Education
School District Performance [1]	Actual school district composite pass rate for first-time test takers on the Ohio Proficiency Test in year prior to house sale year - percentage of students taking the test for the first who passed all components of the test.	Ohio Dept. of Education
Hedonic House Price Model Variables		
Variable Name	Definition	Source
Lot Size	Size of lot or parcel measured in square feet.	Metroscan
House Size	Total living space in house measured in square feet.	Metroscan
Age of House	Age of house in years.	Metroscan
Bedrooms	Number of bedrooms in house.	Metroscan
Bathrooms	Number of bathrooms in house.	Metroscan
Central Air Conditioning	House has central air conditioning (1=Yes, 0=No).	Metroscan
Full Basement	House has full basement (1=Yes, 0=No).	Metroscan
Partial Basement	House has partial basement (1=Yes, 0=No).	Metroscan
1993 House Sale	House was sold during 1993.	Metroscan
1994 House Sale	House was sold during 1994.	Metroscan
1995 House Sale	House was sold during 1995.	Metroscan
Neighborhood Educational Attainment	1989 percent of persons 25 years old or older with less than a high school diploma, by census tract.	U.S. Census Bureau
Neighborhood Income	1989 median household income, by census tract.	U.S. Census Bureau
Neighborhood Housing Vacancy	1989 percent of housing units that are vacant, by census tract.	U.S. Census Bureau
School District Performance IV	Instrumental variable of School District Performance.	
School District Tax Rate	School district effective property tax rate in year prior to house sale year measured as a percentage ([property tax levy/total taxable property value]x100).	Ohio Dept. of Education
School District Debt Liability	School district long-term guaranteed debt liability in year prior to house sale year measured as a percentage ([debt liability/total taxable property value]x100).	Ohio Dept. of Education, Ohio Dept. of Taxation, & U.S. Census Bureau
School District Debt Liability Lagged	School district debt liability two years prior to house sale year.	Ohio Dept. of Education, Ohio Dept. of Taxation, & U.S. Census Bureau
Unit House Price [1]	Sales price per square foot for a house (recorded sales price/total living space in square feet)	Metroscan

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